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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/731,331	12/05/2003	Jung-Chih Tsao	67,200-1156	5064
<div><div>7590 TUNG & ASSOCIATES Suite 120 838 W. Long Lake Road Bloomfield Hills, MI 48302</div><div>01/08/2008</div></div>				
			EXAMINER ZHENG, LOIS L	
			ART UNIT 1793	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/731,331

Applicant(s)

TSAO ET AL.

Examiner

Lois Zheng

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 23-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 23-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 24 October 2007 has been entered.

Status of Claims

2. Claims 1-2, 4, 7 and 26 are amended in view of applicant's claim amendments filed 5 September 2007. Claims 13-22 are canceled in view of applicant's amendments. Claims 1-12 and 23-30 are currently under examination.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-12 and 23-30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Independent claims 1, 7 and 26 recite a contact ring adapted to engage a backside non-plating surface of the substrate across a diameter of said substrate.

However, Fig. 4 of the instant application and the instant specification, as pointed out by the applicant, do not provide literal support for the claimed contact ring being across a diameter of the substrate.

Claims 2-6, 8-12, 23-25 and 27-30 are also rejected because they depend on rejected claims 1, 7 and 26.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-12 and 23-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Independent claims 1, 7 and 26 recite a contact ring adapted to engage a backside non-plating surface of the substrate across a diameter of said substrate. The term "contact ring" is contradictory to the amended term "across a diameter of said substrate". According to www.dictionary.com, the word "ring" is defined as a circular band or a circular object with a vacant circular center. Therefore, by the definition of "ring", it is not possible for the claimed contact ring to engage a backside non-plating surface of the substrate across a diameter of said substrate since the contact ring has a vacant center. If the instantly claimed apparatus electrically connects the non-plating surface of the substrate across a diameter of the substrate, then the electrical connection member cannot be of a ring shape. Therefore, the instant claims 1, 7 and

26 are vague and indefinite. It is unclear to the examiner whether the applicant intends to claim a ring shape electrical contact or an electrical contact that is disposed across a diameter of the substrate.

In this Office Action, the examiner will interpret the electrical contact to be any contact that engaging the non-plating surface of the substrate across the diameter of the substrate, not a ring shaped electrical contact.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-4, 7-10, 23-24, 26-27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lakshmikanthan et al. US 6,228,233 B1(Lakshmikanthan) in view of Talieh et al. US 6,497,800 B1(Talieh), and further in view of Oberlitner et al. US 6,547,937 B1(Oberlitner).

Lakshmikanthan teaches an electroplating cell comprising a bath container, an anode immersed in an electrolyte bath in the bath container, a current source connecting to the anode and to a contact ring electrically connecting to the front side of the substrate(Fig. 2 #102, 108, 122 and 114).

Regarding claims 1 and 7, Lakshmikanthan further teaches that its electroplating cell comprises a variable pressure application system. The variable pressure application system as taught by Lakshmikanthan comprises a mounting plate, a bladder

assembly located at the edge region of the mounting plate and a pressure/vacuum pumping system located at the center region of the mounting plate(Fig. 2 # 132, Fig. 2A # 130 and Fig. 2 # 159). The bladder assembly, connected to a pressure source(Fig. 2 #138), when inflated pushes the wafer against the contact ring, which is located at the peripheral region of the wafer, to position the wafer and establishing the electrical connection to the wafer(col. 6 line 41 – col. 7 line 8). The pressure/vacuum pumping system, connected to a separate pressure source(Fig. 2 # 145), applies pressure to the backside of the wafer to create a bowing effect that results in superior deposition(col. 7 lines 42-55). Since the pressure from the bladder system and the pressure/vacuum pumping system as taught by Lakshmikanthan can be separately controlled(col. 6 line 66 – col. 7 line 3, col. 7 lines 46-50), the examiner concludes that the variable pressure application system of Lakshmikanthan is capable of asserting a lower peripheral pressure and a higher central pressure on the wafer as claimed.

However, the contacting ring as taught by Lakshmikanthan is located on the plating surface of the substrate instead of the non-plating surface of the substrate across a diameter of the substrate as claimed.

Talieh teaches an electroplating apparatus wherein an electrical contact plate is used(Figs. 6A-6C). Figs 6A-6C of Talieh further shows various electrical contact pin distributions that would have engaged the substrate across a diameter of the substrate.

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the electrical contact plate with various contact pin distributions across the diameter of the substrate as taught by Talieh into the electroplating apparatus Of

Lakshmikanthan in order to achieve uniform plating thickness as taught by Talieh(col. 6 lines 32-37).

Oberlitner teaches an electroplating apparatus wherein an electrical contact ring engages the backside or the non-plating side of the substrate(Fig. 27 #174, 198) and a backside pressure is applied against the substrate(col. 16 line 60 – col. 17 line 7). Oberlitner further teaches that one skilled in the art would have easily incorporated a front side contact instead of a backside contact(col. 17 lines 17-20).

Therefore, it would have been obvious to one of ordinary skill in the art to have substituted the front side contact plate as taught by Lakshmikanthan in view of Talieh with a backside contact plate with expected success since Oberlitner's teaching indicates that both front side contact and backside contact are well known functionally equivalent techniques in the electroplating art.

Regarding claims 1 and 7, the variable pressure application system as taught by Lakshmikanthan in view of Talieh and Oberlitner is capable of engaging the backside contact plate and applying variable pressure to the central and peripheral regions of the substrate backside as claimed.

Regarding claims 2 and 8, the mounting plate as taught by Lakshmikanthan reads on the claimed thrust pad and is capable of engaging the contact plate of Lakshmikanthan in view of Talieh and Oberlitner to transmit a central pressure and a peripheral pressure to the contact plate.

Regarding claim 26, the instant claim is mostly rejected for the same reasons as stated in the rejection of claims 1-2 and 7-8 above. In addition, the electroplating

apparatus of Lakshmikanthan in view of Talieh and Oberlitner is capable of plating metal on the front side center region of the substrate as claimed.

Regarding claims 3, 9 and 27, Lakshmikanthan further teaches that the gas supply used for inflating the bladder assembly can be air(col. 6 lines 46-48). The examiner believes that using air as gas supply for the pressure/vacuum pumping system is also within the scope of Lakshmikanthan in view of Talieh and Oberlitner. Therefore, the gas supply for the bladder system of Lakshmikanthan in view of Talieh and Oberlitner reads on the claimed peripheral air source and the gas supply for the pressure/vacuum pumping system of Lakshmikanthan in view of Talieh and Oberlitner reads on the claimed central air source.

Regarding claims 4 and 10, the mounting pad as taught by Lakshmikanthan Talieh and Oberlitner is capable of engaging the variable pressure application and the contacting for transmitting a central pressure and a peripheral pressure as claimed.

Regarding claims 23-24 and 29, the claimed central and peripheral pressure are directed to the operating pressure for the claimed apparatus, therefore, are process limitations. As stated in MPEP 2114 [R-1], it is well settled that the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus as long as the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Therefore, these pressure limitations do not lend patentability to the instant claim since they are process limitations and provide no additional structural limitations to distinguish the claimed apparatus from the prior art.

9. Claims 5-6, 11-12, 25, 28 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lakshmikanthan in view of Talieh and Oberlitner, and further in view of Dordi et al. US 6,416,647 B1(Dordi).

The teachings of Lakshmikanthan in view of Talieh and Oberlitner are discussed in paragraph 8 above. Lakshmikanthan further teaches that its bladder system comprises a plurality of inlet ports provide gas supply to inflate the bladder system(col. 5 lines 15-23, col. 5 line 66 – col. 6 line 2). Therefore, the plurality of inlet ports in the bladder system as taught by Lakshmikanthan reads on the claimed plurality of peripheral air openings.

However, Lakshmikanthan in view of Talieh and Oberlitner do not explicitly teach the claimed plurality of central air openings.

Dordi teaches an electroplating apparatus comprising plurality of openings on the wafer supporting surface for blowing gas flow to the backside of the wafer in order to prevent backside contamination(abstract).

Regarding claims 5, 11 and 28, it would have been obvious to one of ordinary skill in the art to have incorporated the plurality of openings as taught by Dordi into the pressure/vacuum pumping system of Lakshmikanthan in view of Talieh and Oberlitner in order to prevent backside contamination as taught by Dordi. Therefore, the plurality of openings in the pressure/vacuum pumping system of Lakshmikanthan in view of Talieh, Oberlitner and Dordi read on the claimed plurality of central air openings. The mounting plate as taught by Lakshmikanthan in view of Talieh, Oberlitner and Dordi reads on the claimed platen.

Regarding claims 6, the mounting plate as taught by Lakshmikanthan in view of Talieh, Oberlitner and Dordi reads on the claimed platen to engage the backside contact and to transmit a center pressure and a peripheral pressure as recited in instant claim 6.

Regarding claim 12, the instant claim is rejected for the same reasons as stated in the rejection of claim 10 above.

Regarding claims 25 and 30, Lakshmikanthan further teaches that the anode provides metal source for the electrolyte(col. 4 lines 43-45), which implies that the anode is a consumable anode that comprises the metal to be electroplated. However, Lakshmikanthan in view of Talieh and Oberlitner do not explicitly teach that the anode comprises copper.

Dordi teaches electroplating copper onto semiconductor substrate using a consumable anode(col. 2 lines 3-31 and abstract).

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated a consumable anode comprising copper as taught by Dordi into the apparatus of Lakshmikanthan in view of Talieh, Oberlitner since Dordi teaches that copper is a desirable metal for the interconnect features on semiconductor substrates (col. 2 lines 9-11).

Response to Arguments

10. Applicant's arguments filed 5 September 2007 have been fully considered but they are not persuasive.

In the remarks, applicant argues that Lakshmikanthan does not teach a contact ring that engages a backside non-plating surface of a substrate across a diameter of the substrate.

However, applicant's argument is moot in view of the new ground of rejection based on Lakshmikanthan in view of Talieh and Oberlitner as set forth in paragraph 8 above.

Applicant further argues that Lakshmikanthan does not teach a variable pressure application system that is adapted to apply a central pressure to a center region of the substrate backside through said contact ring and a peripheral pressure less than said central pressure.

The examiner does not find applicant's argument persuasive since the claimed less peripheral pressure than the central pressure is directed to the operation of the claimed apparatus(i.e. process limitation), therefore, does not render the instant apparatus claim patentable. In addition, Lakshmikanthan's variable pressure application system is capable of applying a peripheral pressure less than a central pressure since the peripheral pressure applied by the bladder assembly and the central pressure applied by the pressure/vacuum system are separately controlled. Furthermore, the contact plate with various contact distributions across the diameter of the substrate as taught by the combination of Lakshmikanthan and Talieh will allow the central pressure to be applied through the electrical contact as claimed.

Applicant further argues that Oberlitner does not teach front-side contacts and does not explain how to provide front-side contacts without scraping or ruining the

substrate surface. Modifying the apparatus of Lakshmikanthan based on the teachings of Oberlitner would have rendered the apparatus of Lakshmikanthan unsuitable for its intended purpose.

The examiner respectfully disagrees. Although Oberlitner does not explicitly teach how to provide front-side contacts without scraping the substrate surface, Oberlitner does teach that "While a backside contact has been disclosed..., one skilled in the art should readily appreciate that other embodiments incorporating front side contact would similarly be possible"(col. 17 Lines 17-20). Therefore, Oberlitner's teaching implies that the knowledge of backside electroplating apparatus and the knowledge of frontside electroplating apparatus are both well known to one of ordinary skill in the electroplating art and both of them perform the same function of providing electrical contacts to the substrate to allow electrodeposition to take place. The examiner maintains that Oberlitner's teaching shows that backside contact and frontside contacts are functionally equivalent. In addition, it also would have been within the skills of an ordinary artisan in the art to make any necessary modifications to a frontside contact apparatus of Lakshmikanthan in view of Talieh in order to adapt a backside contact setup as taught by Oberlitner. Furthermore, the frontside contact as taught by Lakshmikanthan also provides support for positioning the substrate. One of ordinary skill in the art would have found it obvious to make modification to the top wall of the plating cell to provide support for the substrate when adapting a backside contact in the apparatus of Lakshmikanthan in view of Talieh.

Applicant's further arguments regarding the mounting plate of Lakshmikanthan are moot in view of the new grounds of rejection based on Lakshmikanthan in view of Talieh and Oberlitner as set forth in paragraph 8 above.

Applicant further argues that the combination of Lakshmikanthan with Dordi would make the apparatus of Lakshmikanthan unsuitable for its intended purpose.

The examiner does not find applicant's argument persuasive since the multiple vacuum ports as taught by Dordi is also used to provide blow-off gas to prevent backside contamination. Therefore, these ports as taught by Dordi are capable of providing variable pressure to the backside of the substrate(i.e. negative pressure when vacuum is applied and positive pressure when blow-off gas is applied). Since the backside pressure supply system as taught by Lakshmikanthan can also supply both pressure and vacuum(col. 5 lines 51-56), the incorporation of multiple ports as taught by Dordi into the apparatus of Lakshmikanthan would not have changed the operations of Lakshmikanthan's apparatus. Furthermore, with the incorporation of a contact plate with various contact distributions across the diameter of the substrate as taught by Talieh, the blow-off gas would not have break the backside seal as alleged by the applicant and would not make it unsuitable for its intended purpose of Lakshmikanthan.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lois Zheng whose telephone number is (571) 272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LLZ


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